

Akademia Humanistyczna im. Aleksandra Gieysztora
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GRÓB MIKOŁAJA KOPERNIKA ODKRYCIE I IDENTYFIKACJA

Nicholaus' Copernicus Tomb Discovery and Identification

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Nicolaus Copernicus' DNA found in Uppsala

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Introduction

Uppsala University is the oldest university in Scandinavia, founded in 1477. The Astronomical Observatory has an almost complete library from the end of the Middle Ages to modern times. The most valuable book in this collection is Nicolaus Copernicus' own copy of Johannes Stöffler's *Calendarium Romanum Magnum* printed in 1518 and used by Copernicus from 1518 to his death in 1543.

This book together with 45 other books from the Chapter Library in Frombork was taken as booty of war in 1626. The provenance "Liber Bibliotheca Varmiensis" is written on the title page of these books. Today 39 of these books are included in the collection of books at Carolina Rediviva, the University Library in Uppsala, two belong to the Library of the Astronomical Observatory in Uppsala, three can be found in the Chapter Library in Strängnäs, one book in Linköping and one book in the Royal Library in Stockholm. Many of these books have belonged to Copernicus' private library and have notations by his hand in the margin (Birkenmajer 1924).

One of the two books from the Astronomical Observatory mentioned above does not have the provenance "Liber Bibliotheca Varmiensis" written on the title page. It is a copy of the second edition of Copernicus' *De revolutionibus orbium coelestium* printed in 1566, but with a copy of Copernicus' *Letter against Werner*, written in 1524, attached to the inside of the covers. I believe that Olaus Luth, who studied in Rostock, Greifswald and Wittenberg, bought this book in Wittenberg before 1570. He became professor in Theology in Uppsala 1571, but had enough knowledge in astronomy to give lectures in astronomy at the university.

The Copernicus' tradition at the Astronomical Observatory in Uppsala

The Librarian at the Astronomical Observatory has always been an astronomer with special knowledge and interest in the History of Science. In the beginning of the 1970s Peter Nilson was Librarian and he was especially interested in the life and work of Nicolaus Copernicus. I was then a student at the Observatory and Peter told me about the two Copernican books in the collection of old books. In 1983 I became doctor in Astronomy at the University in Uppsala. I am also interested in Archaeology and History of Science and have been Librarian



Title page of Nicolaus Copernicus' copy of Johannes Stöffler's *Calendarium Romanum Magnum* printed in Oppenheim in 1518. Belongs to the Library of the Observatory in Uppsala, now exhibited at Museum Gustavianum, Uppsala University.
(Photo Göran Henriksson 2007.)

and responsible for the collection of old instruments at the Observatory. I have been retired since the spring of 2008.

In 1973, during the celebration of the 500 year anniversary of the birth of Copernicus, Peter asked me to assist him with his Copernicus' exhibition at the City Library in Uppsala.

I took also part in the symposium in Poland 1973 organised by IAU (International Astronomical Union) to celebrate Copernicus' 500 year anniversary. I had the pleasure of visiting Warsaw, Torun, Gdansk and Frombork.

Professor Paweł Czartoryski visits the Astronomical Observatory in Uppsala

I was responsible for the Observatory one week in June 1972 - 1974, when the Director of the Observatory was absent.

One day in this week a very tall man appeared in the door and presented himself as Professor Paweł Czartoryski, president of the Polish Academy of Sciences. It was of course a great honour to have the president of the Polish Academy of Sciences as a guest, but when he wanted to have a look at two of the most valuable books in the library I hesitated for a moment, because I was not sure of his real identity. However, I decided to let him in to the old library, but I was sitting the whole time at the table beside his. He studied the paper on which the *Letter against Werner* was written and looked for water marks that could date the paper. This letter has been glued to the inside of the covers of the second edition of *De Revolutionibus*, printed in Basel 1566. After an hour he was finished and told me that he could not find any water marks at all. However, his conclusion was that the paper was older than about 1550 and that it was not impossible that it was the original letter by the hand of Copernicus.

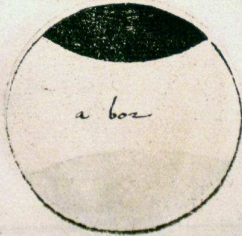
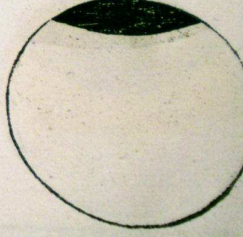
Finally we compared the handwriting of Copernicus in Stöffler's *Calendarium* with the text in the *Letter against Werner* and we could not see any significant differences. In 1993 Professor Paweł Czartoryski sent a letter of thanks to the Librarian of the Observatory and donated a copy of volume IV of *Nicholas Copernicus complete works* to the Library.

There exist seven known copies of the famous letter by Copernicus against Johannes Werner of Nuremberg. This letter was sent to Bernard Wapowski in Cracow on June 3, 1524. For six of the copies it is clear who has copied the letter, but the copy in Uppsala is considered as an "unknown copy" that is the most closely related to the oldest known copy made in Prague 1531. This is a complete letter with even the front side of the envelope preserved. When I held the front cover of the book close to a light source it was possible to see through the paper that something was written on the hidden front side of the envelope glued to the front cover of the book. This is probably the name and address of the receiver but it is difficult to read without removing the paper from the cover. It seems not to have been noted before that on the inside of the envelope there is written in Latin that Erasmus Reinhold, lecturer at the Academy in Wittenberg died in 1553. This text was most probably written by the next owner of this letter after Erasmus Reinhold (1511-1553), professor in applied mathematics, especially astronomy, in Wittenberg. This text is not written by the same hand as the letter. Reinhold knew about Copernicus and his heliocentric ideas prior to the publication of *De revolutionibus* in 1543.

Copernicus' eclipse observations

My speciality is calculations of ancient solar eclipses back to 3000 BC (Henriksson 2009). In 1989 I tested my computer program by a comparison with five solar eclipse observations made by Copernicus and documented in Latin by him in the corresponding figures of Stöffler's *Calendarium*. The first observation was performed in Cracow 1518 and the last was made in Frombork 1541. All of these eclipses were partial solar eclipses.

The mean value of the differences between Copernicus' observed times and my calculated times are $-3.0 \text{ minutes} \pm 2.5 \text{ minutes}$. If these values are converted to angles on the sky we can conclude that Copernicus was a very good observer and the corresponding mean error corresponds to $-0.8' \pm 0.7'$.

1541			1542		
ECLYPSIS SOLIS			ECLYPSIS LVNE		
Die	Hore	Minuta	Die	Hore	Minuta
20	0	54	1	8	47
Augusti.			Martij.		
Dimidia duratio			Dimidia duratio		
Hore	Minuta		Hore	Minuta	
0	39		0	44	
Puncta. 3 hore 4 1/2			Puncta. 1 38		
					

The last solar eclipse observation made by Copernicus in 1541 and documented by him in the margin of Stöfler's *Calendarium*.

Professor Jerzy Gassowsky's lecture in Uppsala

During October 2006 there was a Polish week in Uppsala with lectures and an exhibition devoted to Copernicus at *Museum Gustavianum*, the University Museum in Uppsala. The exhibition showed instruments from the collection of old instruments at the University of Cracow and some books from the Chapter Library in Frombork, originally owned by Copernicus, and now belonging to the University Library in Uppsala.

During the first day of this Polish week professor Jerzy Gassowsky presented the final results from his search for the tomb of Copernicus in the Cathedral in Frombork, in front of the altar that Copernicus was responsible for as a canon. A cranium was found that possibly had belonged to Copernicus and a reconstruction of the face made by experts from the Polish police looked very similar to the portraits of Copernicus. To prove that it really is the cranium of Copernicus it was considered to be necessary to compare DNA taken from a tooth, with DNA taken from a relative to Copernicus on his mother's side. The most obvious candidate was his uncle Bishop Lucas Watzenrode. However, all attempts so far to identify the coffin of Bishop Lucas has failed. It was really a fascinating talk and the anthropological evidence presented was convincing; but it was a pity that no comparison DNA could be found.

I had some special knowledge of Copernicus and his work and during the end of the lecture I remembered the two books related to Copernicus, and now belonging to the Library of the Observatory, and I realised that there might still be traces of Copernicus' DNA preserved on some surfaces in these books. Fortunately I was sitting on the second row in the lecture hall, just in front of Professor Gassowsky, and it was easy for me to talk with him directly after his lecture.

I suggested to Professor Gassowsky that there might be DNA from Copernicus in the books from his library preserved today in Uppsala and particularly in the two books in the Library of the Astronomical Observatory. I told him that one of them contains a letter, possibly written

by the hand of Copernicus, and that the other was an important book used by him from 1518 to his death in 1543 and with his comments and notations about solar and lunar eclipses.

I also proposed that Doctor Marie Allen from Uppsala University should make the DNA investigation.

Discussion with Professor Wladyslaw Duczko

Some days later in the Polish week in Uppsala I listened to an interesting lecture about the common Swedish-Polish history by my old friend, Wladyslaw Duczko, professor in Archaeology, at the University in Pultusk. After the lecture at the City Library in Uppsala we walked together and discussed the lecture and when we were outside my home I also presented to Wladyslaw the idea that there might exist biological remains from Copernicus in two books at the Observatory Library and that Marie Allen, famous for her investigations of ancient DNA from King Karl XII and Saint Brigida, should be asked to perform the DNA analysis.

Wladyslaw liked this idea and became very enthusiastic and promised to propose it for his colleagues when he came back to Poland.

I started immediately a preliminary investigation of the two books. I found some traces of biological material on the *Letter against Werner*, but I had of course no possibility to know if it belonged to Copernicus, and I looked carefully on every page of Copernicus' copy of Stöffler's *Calendarium* and especially the pages with underlining or comments in the margin.

Doctor Marie Allen was then contacted and we met for the first time at the University Library on December 22, in 2006, to have a look at the *Letter against Werner*. The book with this letter is for security reasons no longer placed in the Library of the Observatory, but has been transferred to the security room at the University Library. We found some promising traces that might be biological material on the surface of the letter and noticed also the possibility to find undisturbed biological material on the hidden side of the papers.

Marie explained the difficulties to isolate old DNA if there is younger DNA present and that the best method was to cut out some piece of the paper.

An important meeting at Museum Gustavianum, Uppsala University Museum

In this situation I decided that it was better to look for biological material from Copernicus in his copy of Stöffler's *Calendarium* used by him during 25 years. I studied especially the pages where he had made comments. For a short moment I became very excited because there was an obvious black fingerprint from a right-hand thumb, but it had the same colour as the printed text, so it was most probably the fingerprint by the printer.

On September 24, in 2007, Marie, Wladyslaw and I met for the first time at Museum Gustavianum where Copernicus' copy of Stöffler's *Calendarium* was exhibited.

Once again Marie explained that it might be necessary to cut out a piece of an interesting page or to use wet cotton to get enough amount of biological material for a useful DNA analysis. The situation seemed to be very critical because if we must do something that could damage the book we must have permission by the experts at the University Library and the responsible authorities, and Wladyslaw said that we must get rapid results otherwise there will be no money at all for the project.

Then I realised that it was much easier to look for hairs in the book because Copernicus had used this book during 25 years and probably read every page much more carefully than any later reader. Therefore I thought that there should be more hairs from Copernicus preserved in the inner parts of the pages than from all later scientists who just looked at the pages and made notations about the margin comments. While I proposed that we should look for hairs I took the book in my hands, with gloves on, opened it and discovered immediately a hair in the inner part of the two pages opened first. I could not realise that it was true, but after a few

seconds I showed the hair to Marie and Wladyslaw and we became very excited. I gave the hair to Marie who took care of it and then we started to look for more. Marie had not expected to get any biological material during this meeting and had no test tubes, but she improvised and made envelopes from a piece of paper.

I realised that this might be a historical moment and began to take pictures of the hairs we had found and of our investigation of the book.



The first hairs found in Stöffler's *Calendarium*. (Photo Göran Henriksson , 24 September 2007.)



Wladyslaw Duczko, Göran Henriksson and Marie Allen looking for hairs in Stöffler's *Calendarium*. (Photo Urban Josefsson, 24 September 2007.)

A Polish film team visits Uppsala

On February 6, in 2008, a Polish film team visited Uppsala to film our search for biological remains from Copernicus. They already knew that we had found some hairs in Stöffler's *Calendarium* and we were asked to look for more hairs in front of the camera. We were lucky to find 9 hairs, which we missed during our first investigation.

Marie's DNA analysis during the spring of 2008 showed that the DNA from two of the hairs we found in Stöffler's *Calendarium* matched the DNA from a tooth from the cranium found in the tomb in Frombork that was supposed to be the tomb of Nicolaus Copernicus.

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